

REMARKS

Claims 1-34 have been cancelled without prejudice. Applicants reserve the right to prosecute subject matter of the canceled claims in subsequent patent applications.

New claims 35-48 have been added. Support for the new claims can be found throughout the specification as well as in the originally filed claims. No new matter has been added by this amendment. After entry of this amendment claims 35-48 will be pending.

Claim Rejection under 35 USC 112, first paragraph

Previously pending claims 8-9, 14,20-23 and 30-34 were rejected under 35 USC 112, first paragraph, as allegedly containing subject matter that was not described in the specification in such a way as to reasonably convey to one skilled in the art that the inventors had possession of the claimed invention at the time the application was filed.

New claims 35-48 define subject matter which is described in the specification in such a way as to reasonably convey to one skilled in the art that the inventors had possession of the claimed subject matter at the time the application was filed.

As discussed in previous Responses, to fulfil the written description requirement it is not necessary in a patent application to describe information and facts known to those skilled in the art or list every possible endoglucanase known at the time of the invention.

Applicants would like to draw the attention of the Office to three references. As previously discussed and incorporated by reference in the present application, Jung *et. al.* describes endoglucanases and in particular endoglucanases from *T. fusca*. In Jung, *et. al.* on page 3032, the last paragraph of the introduction, there is a discussion of the E1, E2, E4, and E5 genes. Jung reports that “(e)ach *T. fusca* cellulose is a member of one of the known cellulose families. The genes in each family (14, 17) share similarities in the protein sequences of their catalytic domains but do not necessarily have similar enzymatic activities.” Jung goes on to say that E1 is a member of family E, E2 is a member of family B and E5 is a member of family A.

Applicants would now like to draw the attention of the Office to the references cited in the previous quote as (14, 17) and included in the Supplemental Information Disclosure Statement, submitted herewith. Reference 14 is Gilkes, *et. al.*, (1991), Microbiol. Rev. 55:303-315, entitled Domains in microbial β -1,4-endoglycanases: sequence conservation, function, and enzyme families. Reference 17 is Henrissat, *et. al.*, (1989) Gene 81:83-95, entitled Cellulase families revealed by hydrophobic cluster analysis.

Gilkes, *et. al.* describe the structural elements of cellulases and xylanases, including the structure of endoglucanases (EC 3.2.1.4). In particular, Figure 1 on page 307, provides an alignment of amino acid sequences of bacterial cellulose binding domains and their conserved regions, Table 5 on pages 309-310 provides a list of endoglucanases, broken out by family, with references for each sequence, and the section entitled "Structural Elements in Cellulases and Xylanases" on page 303 gives an in depth description of the structural elements of endoglucanases. Gilkes, *et. al.* describe in detail the sequence, structure and function of microbial endoglucanases.

Henrissat, *et. al.* uses hydrophobic cluster analysis to describe and classify EC 3.2.1.4 endoglucanases, as well as cellobiohydrolases (EC 3.2.1.91). Table 1 on page 85 provides a list of endoglucanases (abbreviated as EG on the table) from a variety of sources as well as references to their sequences. Figures 1-5 provide HCA plots describing conserved domains of cellulases from specific families. Henrissat, *et. al.* describe in detail the sequence, structure and function of microbial endoglucanases.

Clearly, the structure, sequence and functional domains of endoglucanases (EC 3.2.1.4) were well known and described in the art available at the time of filing of the present application and in the present application itself. Therefore, the specification provides sufficient written description to support the present claims.

Applicants submit that these remarks and the new claims overcome this rejection and request its withdrawal.

Claim Rejection under 35 USC 112, first paragraph

Previously pending claims 8-9, 14, 20-23 and 30-34 are rejected under 35 USC 112, first paragraph, as allegedly being not enabled by the specification for all β -1,4-

endoglucanases. In particular, the Office Action suggests that “(t)he instant specification fails to provide guidance for a representative number of other nucleic acids encoding cellulases . . .” Please see page 6 of the Office Action mailed July 17, 2006.

Applicants respectfully traverse. Claims 35-48 are to transgenic plants comprising a nucleic acid encoding a microbial β -1,4-endoglucanase (EC 3.2.1.4). The relevant inquiry for determining whether the scope of the claims is commensurate with the specification is “whether the scope of enablement provided to one of ordinary skill in the art by the disclosure is such as to be commensurate with the scope of protection sought by the claims.” In re Morre, 439 F.2d 1232, 1236 (CCPA 1971). “A patent need not teach, and preferably omits, what is well known in the art.” Hybridtech Inc. v. Monoclonal Antibodies, Inc., 802 F.2d 1367, 231 USPQ 81 (Fed. Cir. 1986), Cet. Denied, 480 U.S. 947 (1987).

As discussed in the previous section of this response, the structure, function and sequence of numerous microbial endoglucanases was known and referenced in the specification. Please see in particular page 4 of the specification, as well as, the Gilkes, *et. al.* and Henrissat, *et. al.* references. Because endoglucanases are well known in the art, not every endoglucanase needs to be included in the specification. In addition, examples A1 to C13 in the present specification provide numerous examples of expression constructs comprising a nucleic acid encoding members of three representative families of endoglucanases, E1, E2, and E5. Applicants have provided sufficient scope of enablement to one of ordinary skill in the art when taking into consideration the scope of protection sought by the claims. Therefore, the presently pending claims are enabled for transgenic plants comprising a nucleic acid encoding a microbial β -1,4-endoglucanase.

The current Office Action, mailed July 17, 2006, also rejects Claim 14, as not enabled, because the specification, allegedly, teaches one source of thermostable microbial β -1,4-endoglucanases, from *T. fusca*, and “does not teach how to make other thermostable microbial β -1,4-endoglucanases”. See page 7 of the Office Action mailed July 17, 2006.

Applicants respectfully traverse. *T. fusca* is a thermophilic soil bacterium. Jung *et. al.* compared the sequences of E1 and E4 to other cellulases. Similarities and differences between endoglucanases from a thermophilic bacterium and other non-thermophilic bacteria were described. Please see pages 3039 to 3041, Figure 7 and Figure 8. This description of the structural differences between an enzyme isolated from a thermophilic organism and an enzyme isolated from a non-thermophilic organism would enable one of skill in the art to recognize thermophilic enzymes.

Applicants submit that the currently pending claims overcome this rejection and request its withdrawal.

Claim Rejection under 35 U.S.C. § 103

Claims 8, 14-15 and 21-23 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Van Ooyen, *et. al.* (US Patent 5,705,375, the '375 patent) in view of Lao, *et. al.* (1991, *J. Bacteriol.* 173:3397-3407). The Office acknowledges that Van Ooyen, *et. al.* do not disclose plants transformed with a nucleic acid encoding an endoglucanase. However, the Office contends that Lao teaches gene encoding the *T. fusca* E2 and E5 β -1,4-endoglucanases and that it would have been obvious to one of ordinary skill in the art to "modify the method of expressing microbial genes in plants as taught by Van Ooyen *et al.*, to the nucleic acids encoding *T. fusca* described in Lao *et al.*" (Page 9 of the Office Action mailed July 17, 2006) The Office further contends that "one of ordinary skill in the art would have been motivated to do so because of the suggestion of Van Ooyen *et al.* to express microbial β -1,4-endoglucanases in plants (column 4, lines 11-36." (Page 9 of the Office Action mailed July 17, 2006)

Applicants respectfully submit that the Office has not met its burden of establishing a *prima facie* case of obviousness over Van Ooyen in light of Lao. Specifically, Applicants submit that modification of Van Ooyen in the manner proposed by the Office would render Van Ooyen's purported invention unsatisfactory for its intended purpose. In addition, expression of cellulose degrading enzymes would be counterintuitive in organisms containing cellulose, such as plants. Please see page 5, the last paragraph before the Summary of the Invention, in the present specification. Therefore, there would have been no motivation to make the proposed modification.

The enzymes disclosed in Van Ooyen are involved in modifying polysaccharide composition, in particular, degradation of starch. (See Col. 3, lines 11-39 of the '375 patent.) The present application describes enzymes expressed in plants that degrade cellulose. Endo-1,4- β -glucanase is mentioned only as one of a laundry list of enzymes that, in theory, could be used in conjunction with "the present invention" to alter plant polysaccharides. (See Col. 4, lines 23-52 of the '375 patent) There is no teaching or suggestion that endoglucanase be used alone or for cellulose degradation. There is no teaching or suggestion as to how to express endoglucanase to overcome the prediction that overexpression of cellulose in a cellulose containing plant would be adverse. There is no teaching of an expression cassette containing only a glucanase or a plant comprising only a glucanase. Given the prediction that cellulose degrading enzymes could be harmful to a cellulose containing organism, one would not be motivated to express a glucanase as described by Van Ooyen. Lack of motivation can also be found by the fact that while microbial glucanases were well known in the art, no attempt to express microbial glucanases in plants can be found until the present application, even though other microbial enzymes, for example the microbial amylase expressed in a plant by Van Ooyen, were expressed in plants.

Contrary to statements within the Office Action, mailed July 17, 2006, Van Ooyen describes promoters that are "active in directing transcription in plants, either constitutively or developmental stage- and/or tissue-specifically, depending on the use of the plant or parts thereof". (Col. 6, lines 20-23 of the '375 patent). Van Ooyen used the constitutive 35S promoter or as described by Van Ooyen, a tuber-specific, class-I patatin promoter. (Col. 6, lines 25-34 of the '375 patent). Van Ooyen did not describe an inducible patatin promoter.

Given the disclosure in Van Ooyen, there would have been no motivation for one skilled in the art to modify the invention of Van Ooyen to express a β -1,4-endoglucanase as claimed in the present invention.

Applicants submit that the currently pending claims overcome this rejection and request its withdrawal.

CONCLUSION

Applicants point out that the above remarks and current claims overcome the rejections. Reconsideration of the application and allowance of all pending claims is earnestly solicited.

Should the Examiner wish to discuss any of the above in greater detail or deem that further amendments should be made to improve the form of the claims, the Examiner is invited to telephone the undersigned at the Examiner's convenience.

Respectfully submitted,



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